Multimorbidity challenges physical activity

Valorisation
Addendum

INTRODUCTION

In addition to the scientific value that has been presented in chapters 2 to 8, this paragraph highlights the societal and economic value of the present thesis. First, the economic and social relevance of this thesis will be highlighted. Second, the potential of our findings for physical therapists, health policy makers and disease prevention officers will be explained. Third, the innovative character of this thesis will be illustrated. Finally, the actions that we have already taken to disseminate the knowledge gained in this thesis will be described. In this paragraph it will also be indicated into which concrete products, services and activities our results can be translated.

SOCIAL AND ECONOMIC BURDEN OF COMORBIDITY AND MULTIMORBIDITY CAUSED BY PHYSICAL INACTIVITY

The increasing prevalence of comorbidity and multimorbidity has been often reported to be closely linked to advanced age and insufficient physical activity [1-5]. Insufficient physical activity has become a leading risk factor for chronic illness causing one million deaths worldwide (about 10% of the total number of deaths) per year. Furthermore, insufficient physical activity levels have been estimated to globally cause 5% of the burden of coronary artery disease, 7% of diabetes mellitus type two, 9% of breast cancer and 10% of colon cancer [6]. Subsequently, the World Health Organization physical activity strategy for the European Region 2016 to 2025 focuses on physical activity as leading factor in health, with particular attention to the burden of chronic diseases associated with insufficient activity levels and sedentary behaviour [7]. Insufficient physical activity in this context from a national perspective is defined as non-compliance with the corresponding age-specific version of the Dutch physical activity guideline (Nederlandse Norm Gezond Bewegen (NNGB)) [8].

Previous research has shown that regular physical activity plays an important role in the primary and tertiary prevention of multimorbidity [5, 6]. We therefore assume that being physically active may also decrease health care costs in the Netherlands. In this thesis we did not estimate the economic burden of insufficient physical activity in relation to chronic diseases. However, we reviewed the scientific literature and found that 744 million euros per year (2% of the total health care costs in the Netherlands) were attributable to insufficient physical activity levels [9]. Moreover, inadequate physical activity behaviour may also influence the indirect health care costs caused from absenteeism and loss of productivity at work. We found no Dutch study that quantified the indirect costs, however comparable research (in Canada) showed that the costs from loss of productivity that were attributable to insufficient physical activity are the two- to fourfold of the direct health care costs [12].

Furthermore, the social burden of multimorbidity was also not directly studied in this thesis. Results from a study conducted by Mars et al. [13] show that older adults with chronic physical illness characterize social participation with a positive feeling and social contact. However from the literature we also know that advanced age combined with the presence of chronic diseases enhances social isolation [14]. Patients with multimorbidity may feel too sick to go out, resulting in a loss of contact with family and friends. Patient's social contacts are then restricted to those that come to visit them. Physical activity may aid people to renew social contacts. For example, dancing contains physical and social interaction and a degree of cognitive involvement, of which all of these three components are of great importance for the health of older adults [15]. Existing social structures should be used to reach older people in order to encourage them to engage in physical activity. Among others, this could be community centres, faith-based institutions or other social institutions.

As a result of the impact of physical inactivity on the total health care costs in the Netherlands and social loneliness, we encourage health care professionals a) to support patients to engage in or maintain an active lifestyle, b) to educate patients about being physically active as a therapeutic modality and the importance of lifelong physical activity in relation to chronic diseases and c) to routinely prescribe physical activity to their patients and monitor this in accordance with the guidelines provided by the Dutch government [16] and the World Health Organization [17].

TARGET GROUP

The results presented in this thesis are important for everyone, since there is a worldwide trend towards becoming less physically active. In general, it is estimated that one third of all adults living in Europe do not achieve the recommended physical activity levels [18]. Different groups have different needs and challenges related to the promotion of physical activity. In the first part of this thesis, we focused on patients with the index disease intermittent claudication. In this patient group, increasing physical activity and especially walking is the most important lifestyle change and also the main target for treatment. To illustrate, death rates of patients with intermittent claudication who are physically active are one third lower compared to patients with intermittent claudication that are physically inactive [19]. Moreover, physical activity as primary treatment modality for patients with intermittent claudication has shown to be more effective than medication and surgical interventions in increasing maximum walking distance [19, 20]. Furthermore, previous research showed that three months of supervised exercise therapy increases the number of patients that comply with the age-specific minimum recommendation for physical activity in the Netherlands (baseline: 43% and after three months of supervised exercise therapy 63%; p= 0.003) [21]. Therefore, efforts should be

made to enhance physical activity and to implement supervised exercise therapy as routine in the clinical practice of patients with intermittent claudication.

With regards to the population of patients suffering from multimorbidity in general, we showed in the second part of this thesis that it is worthwhile to look at specific subgroups. It seems that specific combinations of chronic diseases (i.e. cardiovascular disease, chronic respiratory disease and diabetes mellitus) are strongly associated with inadequate physical activity behavior (Chapter 6, 7 and 8), although chronic diseases and/or multimorbidity may not be the main obstacle towards physical activity. Synergistic effects of chronic disease pairs on physical activity had been identified for the six chronic disease combinations: chronic respiratory disease and severe back problems; migraine and inflammatory joint disease; chronic respiratory disease and severe kidney disease; chronic respiratory disease and inflammatory joint disease; inflammatory joint disease and rheumatoid arthritis; and rheumatoid arthritis and osteoarthritis of the knees, hips and hands. These results may alert health care professionals on extra low physical activity levels in patients with one of these six chronic disease pairs.

Older adults with specific combinations of chronic diseases, such as cardiovascular disease, chronic respiratory disease and/or diabetes mellitus should seek medical advice before striving to achieve the recommended levels of physical activity. National Dutch physical activity recommendations can be applied to older adults with multimorbidity, however adjustments may be necessary based on exercise capacity, specific health risk or limitation of the individual person. Overall, strong evidence from the American Heart Association demonstrates that older adults who currently do not meet the physical activity recommendation can already gain large benefits by slightly increasing in the duration, frequency and/or intensity of their daily physical activity. Municipalities, communities and employees from fitness centers and people involved in neighborhood initiatives can support physical activity in older adults by offering physical activity programs that are specifically designed for older adults. Existing and new physical activity facilities can especially encourage participation by older adults and the environment should provide opportunities and safe places for walking and/or cycling. Increasingly we see 'movement' gardens 'beweegtuinen' in the outdoor area of Dutch nursing homes or assisted living centers. The purpose of these gardens is to get older adults (more) in motion and a survey showed that older adults are generally very positive about this possibility to be able to 'move' outdoors and that most residents are able to participate in the physical activities on these facilities [22]. As residents of the nursing home are physically active together, they have more and more intensive contact with each other. This additional social aspect showed to have stimulating effects on residents to actively participate in these exercises.

INNOVATIVE ASPECTS

Except for Chapter 2 each study design and/or result presented in this thesis is a novelty. Vignette designs for example have been used in previous physiotherapy research to assess the contemporary state-of-the-art on compliance with physical therapy guidelines in the Netherlands. The results showed moderate adherence rates [23-25]. To our knowledge we were the first that used a vignette design to go one step further and to investigate clinical decision making and deviation from guideline recommendation in case of comorbidity. Regarding research methodologies used, none of the previous studies that examined the influence of demographics and comorbidity on treatment outcome of supervised exercise therapy in patients with intermittent claudication used a multi-level mixed linear regression model to acknowledge that patients received treatment by different physiotherapists (chapter 4). Another fundamental innovative study was conducted in Chapter 5 in which we studied the criticism that randomized controlled trials include too homogeneous samples resulting in poorly generalizable outcomes. To our knowledge, we were the first that determined the degree of patient selection and treatment response in randomized controlled trials, by comparing baseline characteristics of patients, in our case, with intermittent claudication receiving supervised exercise therapy included in clinical trials and patients treated in usual care.

The main novel aspect of the present thesis is that we combined medical research and public health research. Huge amounts of medical research have been previously conducted that focused on patterns of multimorbidity and underlying pathophysiological mechanisms. In contrast, most public health research has been directed towards the numerous health benefits of physical activity to reduce the burden of chronic illness. Only four studies could be found in the literature that assessed the association between the medical phenomenon ‘multimorbidity’ and the public health determinant ‘physical activity’ [3-5, 26]. However, all four used the mere count of chronic diseases to operationalize multimorbidity. We reasonably hypothesized that specific combinations of chronic diseases probably better explain the association with physical activity. Therefore, in chapters 6, 7 and 8 we presented three unique studies that investigated the association between specific combinations of chronic diseases in relation to physical activity. In chapter 7 we added a second original layer to existing multimorbidity research by examining whether the synergistic effects of chronic disease combinations on physical activity. Another shared advantage of all studies presented in chapters 4 to 8 is the large sample size.

TRANSFER OF KNOWLEDGE

Four scientific articles have been published in international scientific journals. Scientific presentations have been given on several national and international conferences and symposia to share our knowledge gained with other researchers and professionals. For instance, we gave a presentation at the PhD symposium of the Jagiellonian University (2012) Krakow, Poland; the symposium of the Public Health Doctoral Network (2013) in Paris, France; the annual conference of the Guidelines International Network (2014) in Melbourne, Australia; the European Epidemiology Congress (2015) in Maastricht, the Netherlands; and the American Congress of Rehabilitation Medicine (2015) in Dallas, Texas.

To spread our newly gained knowledge most efficiently to our research community we published the results presented in chapter 6 and 7 in special issues. These two special issues (one on multimorbidity, one on physical activity) drew together a range of contributions on multimorbidity and physical activity and allowed therefore more in-depth treatment of our topic than is normally possible within a general journal issue. Furthermore, we made strides in advancing essential knowledge to a local, regional audience by secondary publishing of our results in three different languages (Dutch, German and French) in specialist journals (Chapter 2 and 3). These secondary publications enabled us to reach a wider audience and to show our research output in a simplified way to physical therapists and other health care professionals that might implement this knowledge into clinical practice. Moreover, all ClaudicatioNet physical therapists received a newsletter about our Vignette study to inform them about the results and the conclusions or our study and we presented our findings also at the annual symposium of ClaudicatioNet to also give room for discussion related to the results of our Vignette investigation.

Regarding the implementation of our results we are in close contact with the guideline development group of the Royal Dutch Society for Physical Therapy (KNGF). This group translates the latest evidence into clinical practice guidelines. These guidelines are then used by physical therapists as a reference for treating their patients. Our results contribute to the further development and the updating process of internationally available physical therapy guidelines. We highlighted that physical activity levels are worse in patients with cardiovascular disease, chronic respiratory disease, diabetes mellitus type two and that in six chronic disease combinations the risk for low physical activity exceeds what would be expected based on the effects of each of the two diseases alone. For all these disease combinations a warning regarding possible inadequate physical activity behavior could be added to current guidelines. On an international level, the first author of the present thesis is a member of the working group on multimorbidity and allied health of the Guidelines International Network (G-I-N). This working group is a forum where international experts in the field discuss on how multimorbidity can be addressed in guidelines and how we can improve the care of patients with multimorbidity.

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